The Formation and Evolution of Blue Supergiant Stars (BSGs)

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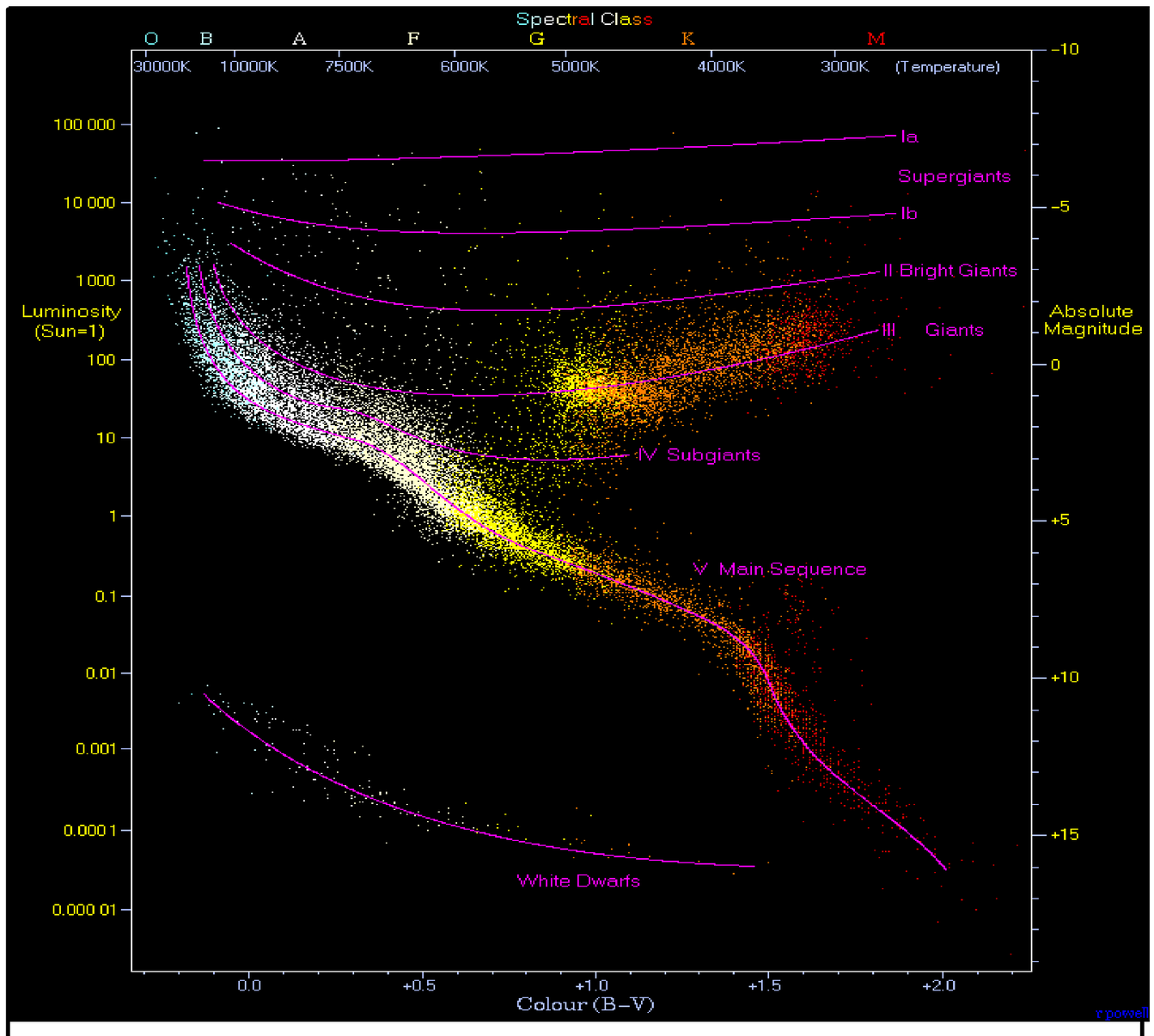
My project

BSGs are very luminous, high mass and temperature O and B type stars with main properties:

- Minimum surface temperature of 11,000K
- Minimum solar radius of 14 R_0
- Minimum luminosity of around 20,000L_0
- Minimum mass of 10M_0

My project's main aim is to research each phase of BSGs to understand phenomena that occur in its life. My objectives to achieve this are:

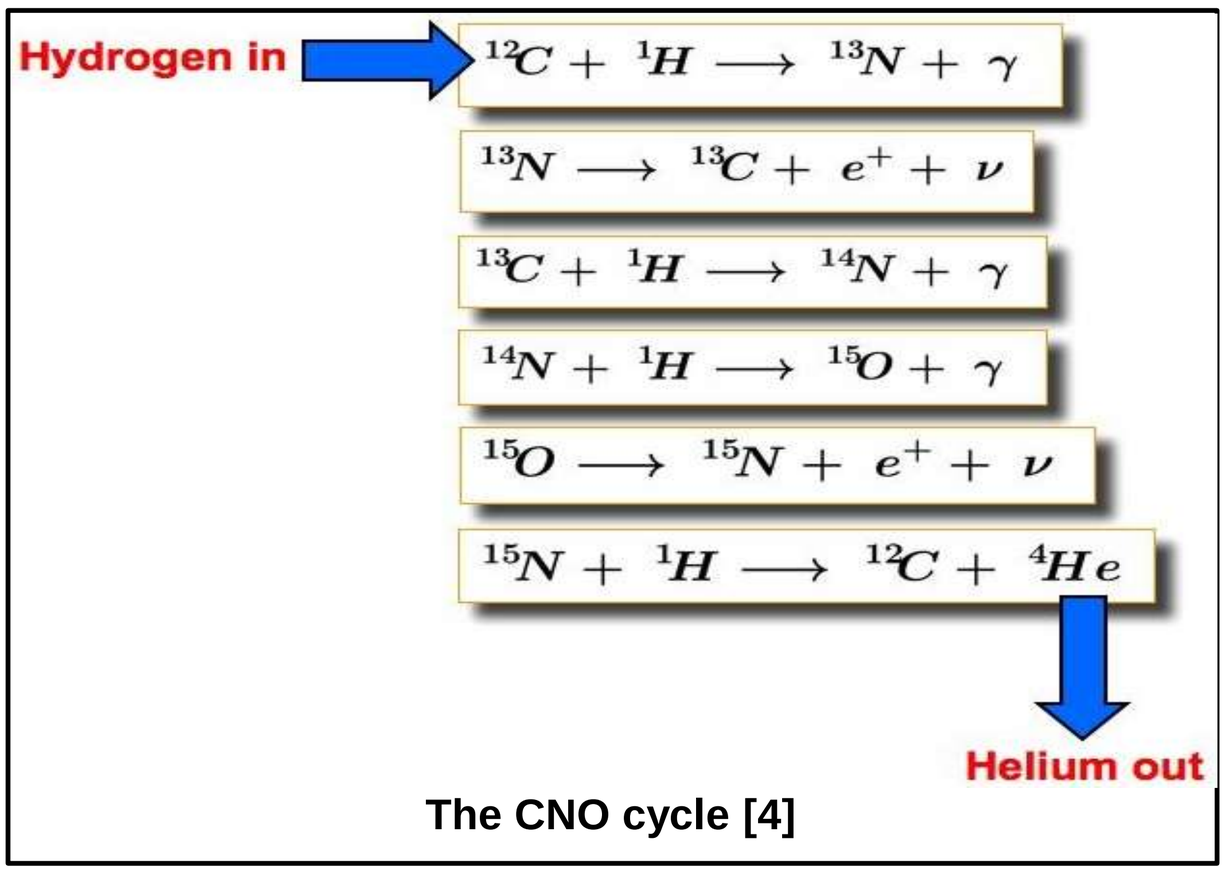
- To compare the properties and formation conditions of BSG and solar stars
- To investigate how BSG evolve into one of their death stages and the impacts they have
- Analyse and compare stellar processes of BSG and solar stars



Hertzsprung-Russell diagram [1]

Initial findings

- Using research as my main method of findings I have discovered that:
- BSGs Form in giant molecular clouds with hydrogen densities larger than that of solar stars and radiative forces play a vital role in formation [2]
- The nuclear fusion process in BSG and other high-mass stars is the CNO cycle as opposed to Proton-Proton fusion which is for low-mass stars, produces around 25MeV per cycle [3].
- BSGs have characteristic strong stellar wind caused by radiative pressure in the core which leads to mass loss as material is ejected out of the star
- Goes supernova once fuel runs out, If above 3M_0 then a black hole forms, if below then a neutron star forms



The CNO cycle [4]

Next steps

- Continue research into the CNO cycle and how it compares/differs to P-P fusion
- Analyse mass loss of BSGs to see if it has a substantial effect on the main sequence phase using the equation:
- $\log\left(\frac{dM}{dt}v_{\infty}\sqrt{R_*}\right) = -10.47 + 1.557 * \log(L_*)$ [5]
- Compare and determine the constructive and destructive effects of supernovas and black holes caused by the death of BSGs on the local galaxies
- Determine the processes that BSGs experience and compare any that also occur in other types of stars

References

[1] Kaler, J., 2006. The Cambridge Encyclopedia Of Stars. 1st ed. Cambridge: Cambridge University Press, pp.99-102.

[2]Zinnecker, H. and Yorke, H., 2007. Toward Understanding Massive Star Formation. *Annual Review of Astronomy and Astrophysics*, 45(1), pp.11-15.

[3] Zoppi, G., 2019. Thermal and nuclear energy. pp 64

[4] Grunhut, J., n.d. Magnetic Fields In Early-Type Stars. [3] Astronomy.swin.edu.au. n.d. CNO Cycle | COSMOS.

[5] Castor, J. and Lamers, H., 1979. An atlas of theoretical P Cygni profiles. *The Astrophysical Journal Supplement Series*, 39, p.481.